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REVIEW 1950 ACHIEVEMENTS OF SOVIET TOOL INDUSTRY

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The output in number of pieces of many types of standardized cutting tools increased 200-300 percent and more in 1950 in comparison with 1946. The production of measuring tools also increased.

The output of fitter's tools such as monkey wrenches, combination cutting and twisting pliers, flat-nosed pliers, etc., increased 300-350 percent.

During 1950, the production of hard-alloy tools was much higher than in 1949 or in 1946. During this time, the number of types of hard-alloy tools expanded. Up to 700 type sizes of drills, counterbores, reamers, milling cutters, cutting tools, centers, etc., were produced. By special order, the plants began producing hard-alloy combination counterbores, reamers, and various milling cutters for combination machine tools.

Various types of face, side, and other milling cutters for high-speed milling were produced. Among the new designs of hard-alloy tools that should be noted are inserted-blade reamers with 30-80 millimeter diameter and end mills with 50-70 millimeter diameter.

In the field of thread-cutting tools, tool plants began the production of special tools for cutting tapered threads in pipe ends and unions for tall buildings in Moscow. Taps, round tangential and special threading dies, thread gauges, special blades, and counterbores for boring holes before threading have been produced. The principles of producing up to 100 type sizes of tools for the above-specified purposes have been mastered.

The principles of producing large boring heads for boring tapered holes of 10-13 inch diameter in unions prior to cutting threads have been mastered.

To aid plants manufacturing unions for tall buildings, tool plants have mastered series production of three types of safety chucks for taps of $\frac{1}{2}$-1 inch, $1\frac{1}{4}$-2 inch, and 6-18 millimeter size.

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Together with the universal-type threading heads being manufactured, the production of heads with round dies for cutting external threads with a diameter of 12-42 millimeters (Type 4K) and, by special order, Type 5K heads for external threads with a diameter of 24-60 millimeters has been organized.

Taking in consideration the ever-expanding applications of highly productive thread knurling, tool plants began to produce flat-knurled dies and knurled rollers.

The production, both in quantity and in type sizes, of precision and hard-to-manufacture tapered threading mills for drilling-pipe couplings has been increased considerably.

The number of types of gear-cutting tools has also increased. In 1950, the production of tools for cutting large-module gears was organized. Inserted-blade end mills, module 25, were made from forged, high-speed steel blanks which increased the durability of the tool. Inserted-blade side mills with 20-24 millimeter module, and inserted-blade (sbornyy) hobs with 28-30 millimeter module, were also produced.

For the manufacture of small-module gears, production of hobs with module 0.15 to module 1, side mills beginning with module 0.3, and cycloidal side mills for special devices was organized.

Production of 12-inch, 9½-inch, 8-inch, 9-inch, and 12-inch gear-cutting tool heads for cutting spiral bevel gears has been mastered and started. The produced range of type sizes of tapered hobs has been expanded also.

The number of types of multicutter gear-cutting heads for Model 5110 machine tools has increased. In 1950, the principles for producing multicutter heads for Model 5120 machine tools for making gears z = 22, 24, 28, 42, 47, module 5/3, 75, and 7, were mastered. The multicutter heads make possible the manufacture of gears by means of slotting on the Model 5120 machine tools in a period of one minute.

The perfection and series production of special composite mills for cutting teeth on spindles for cotton-picking machines should be noted. These mills, which are made up of five pieces, have a total length of 650 millimeters, and a diameter of 100 millimeters; the staggered teeth (narezka) have a 2-millimeter pitch.

In addition to the above achievements, tool plants have mastered and produced a number of tools on special order, such as combination tools for combination machine tools and jig-boring machines, for machining revolving knives (diffuzionnyy nozh) for the sugar /beet/ industry, etc.

The file industry has mastered the production of files of several type sizes for dressing down automobile hoods.

In 1950, a number of standardized tools were modernized, with consideration given to economizing on high-speed steel, to technology, or to increased tool durability.

For purposes of saving high-speed steel, inserted-tooth cylindrical mills of a new design, with 75-150 millimeter diameter and tooth angle of 20 and 45 degrees, are being produced. Instead of wedge-shaped blades, these mills have flat blades. This facilitates production of blades, reduces labor consumption, saves up to 35 percent in high-speed steel, and increases the life of the mill. Gear-slotting tools are being produced with a back angle of up to 9 degrees instead of 6 degrees. This doubles the durability of the tool. Threaded rings /ring gauges?/ with M2-M100 millimeter diameters are being produced with smaller

external diameters, saving up to 40 percent in steel. Further, 125-millimeter slide gauges are being produced with hardened bars, which increase the wear resistance and quality of the tool.

In 1950, files were produced with hardness increased from R_C=50 to R_C=54 by means of high-frequency and salt-bath hardening.

Eighteen new types of high-precision measuring instruments for checking precision bearings have been designed and manufactured. These instruments can measure to an accuracy of tenths and hundredths of a micron.

It is particularly important to note the contact interferometer (kontaktno-interferentsionnyy pribor) for measuring balls. The entire measuring process is accomplished without the operator's hands touching the part. The instrument guarantees measuring precision within 0.1 micron.

Air gauges with special devices for measuring precison-bearing parts within an accuracy of 0.2-0.5 micron have been built. Among these are an instrument for checking diameters of holes as small as 2 millimeters, three-dimensional air gauges for measuring various elements of bearing parts, etc.

Much work has been done by plants on the perfection of new designs of gear measuring instruments. Instruments have been released for inspecting large-module gears. These include pitch gauges for checking circumferential pitch of gears with module up to 25 millimeters, pitch gauges for checking pitch of base circle of gears with module up to 36 millimeters, an instrument for checking the the length of the entire normal of gears with diameter up to 1,000 millimeters and a tangential gear gauge for modules up to 50 millimeters.

A new series of stationary gear-testers has been produced.

Mastered and released is a gear tester of BV design for checking small-module gears, with module of 0.1-1 millimeter, in single-profile meshing. The machine is intended for inspecting accumulated error on the gear teeth, with the use of a rack, where the gears and rack have forced movement corresponding to the correct theoretical meshing. The machine is set by means of [gauge] blocks and a sine bar. An indicator, connected with the rack, records deviations as small as 2 microns in gear profile.

A testing machine of BV design was produced for checking small-module gears, with module of 0.1-1 millimeter, in double-profile meshing. This machine is based on the meshing, without clearance, of gears and two standard racks. One of the racks is secured rigidly, and the other, which moves, is connected with the indicator. Deviation in gear profile is transmitted from the rack to the indicator.

A universal device of MIZ [Moscow Tool Plant?] design for checking profile elements of hobs has been produced. This device checks hobs, module 4-20 millimeters, for angle of profile, projection of normal pitch, radius of front edge, and backlash on outside diameter. The instrument is set by means of [gauge] blocks.

Production of automatic measuring machines has been organized. The principles of manufacturing new models of machines for checking tapered rollers and needles for bearings, piston rings, etc., have been mastered. The automatics are manufactured with the incorporation of electric contact, inductive, and pneumatic means of measuring.

In 1950, production of 30 types of multimeasuring instruments for checking ball and roller bearings was organized. In volume, they fully meet the requirements of the bearings industry.

For equipping the multimeasuring instruments, production of small minimeters with a measuring range of 0.1 millimeter and graduations of 1 micron has been mastered.

For checking surface finish by the comparison method, sets of standards for turning, milling, and other types of machining have been produced. The first groups of three types of pneumatic instruments for checking surface finish have also been produced: two types are for checking the finish of round and flat parts in comparison with the standard, and the third, for determining the exact amount of surface irregularity.

The successful increase in tool output at tool plants was made possible by the extensive introduction of conveyer and mass-production methods, automatics, and labor mechanization.

Some types of tools, such as hand taps, dies, micrometers, and slide gauges, are being produced almost entirely on conveyer lines.

High-speed cutting has been developed at tool plants. The speed of cutting types EI262, 9KhS, and U12 tool steel in turning operations has reached 150-180 meters per minute, and the speed of cutting these same types of steel in milling operations has reached 180 meters per minute.

High-speed grinding at tool plants has been started also. In cylindrical grinding, the speed of the grinding wheel has increased from 30 meters per second to 50 meters per second. The speed of the work piece has been increased to 50 meters per minute, with longitudinal feed at 12-15 millimeters per work revolution, and transverse automatic feed at 0.01-0.02 millimeter for each automatic table stroke. As a result of these operating conditions, the time required for machining each piece has been cut 50 percent.

High-speed thread grinding, based on the increased speed of the work piece, is being introduced. The speed of the work piece during preliminary grinding of thread has been increased from 0.21-1.7 millimeters to 0.42-2.26 millimeters, and during finish grinding, from 0.28-1.7 to 0.56-3.5 millimeters [sic].

In 1950, the principles of rolling threads on micrometer screws were perfected. This assures increased accuracy and has decreased labor consumption 80 percent.

At a number of tool plants, precision casting and the use of wax models have been widely adopted. More than 100 parts for various instruments are being manufactured by this method. Experiments are being conducted on the manufacture of blades made of high-speed steel for inserted-blade cutting tools. The application of the rolling method in the manufacture of twist drills is becoming more and more widespread. Conveyer lines are in operation for the production of tapered-shank drills with the use of the above-specified methods.

In the production of files, roller-straightening machines, as well as new methods of rolling, grinding with a ceramic wheel, and truing on power presses are being used more and more extensively.

These achievements are only a partial solution of problems facing the tool industry. In the ensuing years, personnel at tool plants must introduce conveyer methods of production more extensively, with a view to continuously equipping shops with conveyers as required, automatization and mechanization of operations, and the application of leading methods of high-speed machining, rolling, knurling, and other highly productive industrial processes.

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